

UK Patent Application (19) GB (11) 2 187 081 (13) A

(43) Application published 3 Sep 1987

(21) Application No 8702097

(22) Date of filing 30 Jan 1987

(30) Priority data

(31) 303077

(32) 7 Feb 1986

(33) AR

(51) INT CL⁴
A23B 4/00

(52) Domestic classification (Edition I)
A2D 102 2A 2C1 2E2 2F CA EF PL PR X3
U1S 1291 A2D

(56) Documents cited
None

(58) Field of search
A2D
Selected US specifications from IPC sub-class A23B

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(54) A method for obtaining preserved meat

(57) Meat is preserved, in a packaged storage at room temperature for six months or more without loss of product acceptability, in cuts typically 3 cm, or less, thick, by

(a) immersion or injection with aqueous saline solution containing sodium chloride and polyphosphate and nitrite ions,

(b) dipping the cuts in a syrup-like bath,

(c) drying and cooking the outer surface of the cuts,

(d) further cooking the cuts so that all points reach at least 75°C for at least 15 minutes,

(e) vacuum packing the cuts,

(f) cooling and freezing the packs, and

(g) irradiating the packs with gamma-radiation e.g. at 2Kgy/min to a total dose of 15—45KGy.

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SPECIFICATION**A method for obtaining preserved meat**

This invention relates to a method for obtaining 5 preserved meat, starting from e.g. lean beef, without tendons. More particularly it relates to a method based on the use of gamma-type (micromicrowave) radiation, combined with traditional treatment of meat with the purpose of 10 yielding a preserved product which can be stored at room temperature for over six months while keeping its nutritional value and physical and organoleptic characteristics.

At present, refrigerated meat cuts can be 15 marketed over three days. Frozen meat can be kept and marketed over a significantly longer period. However, uncooked meat which is not refrigerated or frozen has a very limited market especially if it comes from an area which has not been declared 20 free of the foot-and-mouth disease virus.

The method of the present invention sets out to preserve meat cuts at room temperatures to give a product free from contaminating or degrading pathogenic elements, which product can be 25 marketed for over six months without canning or sterilization by autoclave.

In this way, it is possible to supply markets that do not have cooling facilities; to provide a substitute 30 for preserved foods; to eliminate the cost of low temperature storage, handling and/or transportation; to overcome restrictions imposed for sanitary reasons or as preventive quarantine; to optimise replenishment intervals for restocking in economical and commercial respects; and to 35 stockpile products if needed for production or marketing reasons.

The invention consists in a method for obtaining preserved meat which comprises the successive steps of

40 (a) treating cuts of meat by immersion into and/or injection of an aqueous saline solution of sodium chloride, polyphosphate ions and nitrate ions;

(b) removing the treated cuts of meat and immersing them into an aqueous syrup-like bath;

45 (c) removing the cuts of meat and treating them by a process which dries and slightly cooks the surface;

(d) further cooking the cuts of meat in such a manner that every point of each cut of meat reaches 50 and is held at a temperature of at least 75°C for 15 minutes;

(e) vacuum packing the cuts of meat, individually or in groups, within suitable sealed packaging;

(f) cooling and freezing the vacuum packed cuts, 55 and

(g) subjecting the packed cuts to the effect of micromicrowaves.

Results vary according to type of meat, its initial 60 contamination level, the exact treatment combination used and/or the packaging details.

When applying this method, it is preferable to select lean beef, with no tendons, first-quality, minimum contamination, and with an airing (post-slaughter) period not exceeding 2 or 3 days, to give 65 a premium product.

Cuts are prepared in a cutting-room, equipped according to conventional sanitary criteria and preferably do not exceed 3 cms thick (i.e. have no point further than 1.5 cm from a surface).

70 The cuts are immersed and injected with the saline to reduce aqueous activity. Typically, this cures the cuts to some extent. They are thereafter preferably drained off before immersion in the syrup-like bath. They are then cooked until the 75 surface regions become dry and slightly cooked. Subsequently the cuts are further heated by any cooking process (boiling, microwaves, baking ovens, etc.) until the coldest internal point reaches 75°C and kept at least at that temperature.

80 (preferably not unduly higher) for 15 minutes so as to eliminate any enzymatic activity, various viruses, microbes and pink liquid.

The cuts are then packed, using a high vacuum. In this stage, sauces or seasonings can be added.

85 The vacuum packing should be gas-tight and preferably opaque to light and ultraviolet radiation. It should also be preferably be able to bear a temperature variation up to 50°C and a micromicrowave dose not exceeding 50KGy. In such 90 circumstances a final product of 6 months shelf life at room temperature can be obtained.

When packing is completed, each bag is cooled down e.g. until about freezing-point (°C) and then frozen at a temperature preferably below -30°C by 95 means of a fast-freezing process.

Lastly, the product is subjected to micromicrowaves e.g. by passage through a suitable chamber. This operation can be carried out once the product has been already packed for its 100 final marketing: if so each total cut should preferably still be colder than -25°C when it is taken out of the irradiation chamber. The product absorbs a radiation dose of gamma-type radiation (micromicrowave radiation or picowave radiation 105 i.e. of about 10^{-12} wavelength) of more than 15 KGy, and less than 45 KGy, e.g. at a rate of 2KGy/min.

EXAMPLE

Lean beef, with no tendons, first-quality, 110 minimum contamination, with less than 3 days since slaughter, is cut in steaks of 3 cms. thick in the cutting-up room of a cold-storage plant.

The cut steaks pass through a curing machine containing an aqueous solution of 2% of sodium chloride, 3% of sodium tripolyphosphate, and 25 parts per million of sodium nitrite. They are then drained for 5 minutes.

The cuts are then immersed in an orange-juice bath and immediately thereafter exposed to fire 120 until their surface is slightly roasted.

After this the cuts pass through a microwave oven (leaving sufficient space between each cut to make sure the cooking treatment reaches all its faces) and are cooked therein at not less than 75°C at all points, 125 and at a temperature just adequate for this purpose.

Cuts are taken to an automatic thermoforming and vacuum packing machine. The quantity of cuts per bag can vary, but joint packaging of three cuts has been found to reduce costs significantly. During 130 this packaging stage sauces or seasoning can be

added.

A co-extrusion of aluminium-treated polyamide/polyethylene of 300 microns can be used as the thermoformable base of the package. Its upper part

5 is a trilaminate formed by 12 microns of bi-oriented polyethyl-enterephthalate, 10 microns of zero-temper aluminium film, and (as the internal package film) 70 microns of polyethylene. The adhesive used may be an aliphatic polyisocyanate.

10 The packed product is cooled to a nearly freezing point temperature and then, by means of a fast-freezing process, frozen at a temperature below -30°C. The resulting packages were stored in cardboard boxes, which allow for a stable

15 temperature and protect them from tearing, piercing, light and ultraviolet radiation. These boxes need be opened only when the packages are to be displayed at retail stores. Apart from any other necessary printed information, boxes can also bear

20 an international radiated-product symbol, which changes colour when receiving a dose higher than 10 KGy.

Boxes enter a micromicrowave chamber for exposure to gamma-like radiation at a dose rate that 25 may reach 2 KGy per minute up to a minimum dose of 15- KGy. The maximum dose will not exceed 35—45KGy. During exposure to radiation, the whole product should preferably have a temperature colder than -25°C.

30 The end product was capable of keeping its nutritional value, physical, and organoleptic characteristics for at least 6 months on room-temperature storage.

35 CLAIMS

1. A method for obtaining preserved meat which comprises the successive steps of

(a) treating cuts of meat by immersion into and/or injection of an aqueous saline solution of sodium

40 chloride, polyphosphate ions and nitrate ions;

(b) removing the treated cuts of meat and immersing them into an aqueous syrup-like bath;

(c) removing the cuts of meat and treating them by a process which dries and slightly cooks the

45 surface;

(d) further cooking the cuts of meat in such a manner that every point of each cut of meat reaches and is held at a temperature of at least 75°C for 15 minutes;

50 (e) vacuum packing the cuts of meat, individually or in groups, within suitable sealed packaging;

(f) cooling and freezing the vacuum packed cuts,

and

(g) subjecting the packed cuts to the effect of micromicrowaves.

2. A method as claimed in claim 1 in which the saline solution contains by weight not more than 3% sodium chloride and not more than 3% of a source of polyphosphate ion.

60 3. A method as claimed in claim 2 in which the saline solution contains by weight at least 50 p.p.m. of nitrite ion.

4. A method as claimed in claim 2 in which the solution contains by weight not more than 50 p.p.m. of nitrite ion.

5. A method as claimed in claim 3 or 4 in which the saline solution contains not more than 1% of a source of polyphosphate ion.

6. A method as claimed in any one preceding

70 claim in which the cuts are drained of the saline solution before immersion in the syrup-like solution.

7. A method as claimed in claim 6 in which the syrup-like solution is a fruit juice or a sugar solution.

8. A method as claimed in any one preceding

75 claim in which the cuts are of a maximum thickness of 3 cm whereby no internal point is more than 1.5 cm from a surface.

9. A method as claimed in any one preceding claim in which the cooking step (d) is effected by

80 boiling.

10. A method as claimed in any one of claims 1 to 8 in which the cooking step (d) is effected by microwaves.

11. A method as claimed in any one of claims 1 to

85 8 in which the cooking step (d) is effected by baking.

12. A method as claimed in any one preceding claim in which sauces and/or seasoning are added to the cuts during vacuum-packaging.

13. A method as claimed in any one preceding

90 claim in which, in step (f) the cuts are cooled to about 0°C and then frozen at -30°C or below.

14. A method as claimed in any one preceding claim in which the cuts are subjected in step (g) to a total dose of between 15 KGy and 45KGy at a rate of

95 2 KGy/min.

15. A method as claimed in any one preceding claim in which the cuts are subjected in step (g) to the micromicrowaves at a temperature below -25°C.

100 16. A method as claimed in claim 1 substantially as herein specifically described with reference to the Example.

17. Meat preserved by the method as claimed in any one preceding claim.